

32. (NEW) A device according to claim 25, wherein the second layer is approximately 2000 Å to 6000 Å thick.

33. (NEW) A device according to claim 25, wherein additional titanium is formed on one or more of the surfaces that form an inner surface of the sealed cavity in the device. --

#### REMARKS

Entry of the amendments is respectfully requested. Claims 1 and 9 have been amended. Claim 1 was amended to place it in better conformance with preferred U.S. Patent Office Practice without narrowing the claim. Claim 9 was amended to provide proper antecedent basis to "inner surface" and "device" without narrowing the claim. New claims 22-33 have been added. Claims 1-9 and 22-33 are pending in the application. Favorable reconsideration and allowance of this application is respectfully requested in light of the foregoing amendments and the remarks that follow.

1. Restriction Requirement

The applicants hereby acknowledge the election of Group I, claims 1-9 without traverse.

2. Rejection Under § 102(b)

Claims 1-4, 6, and 9 stand rejected under § 102(b) as being anticipated by U.S. Patent No. 5,739,046 to Lur et al. The Applicants respectfully traverse this rejection

because, as is discussed below, the Lur et al. patent does not disclose each and every element of the novel subject matter disclosed and set forth in the claims. Therefore, reconsideration is in order and is respectfully requested.

Claim 1 recites a device having electrical and mechanical components. The device has multiple layers. Claim 1 requires:

a first layer or set of layers *arranged to function as one or more electrodes or conductors*; and  
a second layer arranged to function as one or more press contacts or wire bond pads,  
wherein the second layer has different physical properties than the first layer,  
wherein the first layer or set of layers is relatively hard or tough and the second layer is relatively soft or malleable.

The Lur et al. patent discloses a semiconductor device having multiple layers. However, the layers of the device of Lur et al. do not correspond to those of claim 1. Instead, the device of Lur et al. includes a semiconductor substrate 10, gate electrodes 12, and source/drain regions 14. The device also has a pre-metal dielectric layer 20. A layer of titanium is deposited conformally over the surface of the dielectric layer 20 and within contact openings. The titanium layer is annealed to form a titanium nitride layer 22. Alternatively, a sequential deposition of titanium followed by titanium nitride is performed instead of the annealed titanium layer. (col. 2, lines 23-58). Layer 22 functions as a metal diffusion barrier layer. (col. 3, line 48). A diffusion barrier prevents

reactions with, e.g., silicon. Diffusion barriers are typically made of a refractory metal compound, such as titanium, tantalum, or tungsten nitrides.

Next, layered on top of metal diffusion barrier layer 22 is a metal 24, such as aluminum or an aluminum alloy. A passivation layer 26 completes the structure of Lur et al. (col. 3, lines 48-54).

The Examiner alleges that the layer of titanium/titanium nitride film 22 on the substrate 20 corresponds to the first layer or set of layers of claim 1. This is incorrect. Layer 22 does not *function as one or more electrodes or conductors*, as is required by claim 1. Instead, layer 22 functions as a metal diffusion barrier, as is disclosed by Lur et al. at column 3, line 48. Because Lur et al. does not teach each and every element of claim 1, claim 1 defines over Lur et al.

Dependent claims 2-4, 6, and 9 are believed to be in condition for allowance for incorporating by reference the limitations of claim 1 and for defining additional features of the invention, which, when considered in combination with those of claim 1, are not disclosed by Lur et al. For instance, claim 2 requires that “the first layer or set of layers is formed from titanium.” Claim 3 requires that “the first layer or set of layers is formed from titanium and titanium nitride.” Each and every limitation of these dependent claims is not taught in Lur et al. First, there is no disclosure in Lur et al. of a first layer or set of layers that function as one or more electrodes or conductors *and* that is made from titanium. Although Lur et al. discloses a device having gate electrodes 12,

there is no disclosure of the material from which they are fabricated. Further, as is discussed above, although Lur et al. discloses a device having a layer 22 of titanium or titanium nitride, this layer 22 does not function as one or more electrodes or conductors.

Claim 6 requires that “the first layer or set of layers is approximately 3000 Å to 10000 Å thick.” As is detailed above, the Lur et al. patent fails to disclose the “first layer or set of layers” limitation of claim 1, from which claim 6 depends. Therefore, there can be no disclosure of the specific thicknesses of layer(s) in claim 6.

Claim 9 requires that “additional titanium is formed on one or more of the surfaces that form an inner surface of a sealed cavity in the device.” Clearly, this combination of novel elements is not disclosed in Lur et al. First, there is no disclosure of additional titanium being formed on one or more surfaces that form an inner surface of a sealed cavity. Furthermore, Lur et al. is completely silent regarding a device having a sealed cavity.

In light of the foregoing, withdrawal of the rejection of claims 1-4, 6 and 9 based on Lur et al is respectfully requested.

3. Rejection Under § 103

The rejection of Claims 1, 5, and 7-8 as unpatentable over U.S. Patent No. 5,592,736 to Akram is respectfully traversed, because, *inter alia*, there is no teaching or suggestion to modify the reference to produce the claimed invention. MPEP §2143.01. The Examiner correctly recognizes that Akram fails to specifically disclose the thickness

of the layers. The Examiner attempts to cure this deficiency by stating that "it is known in the art that the layers must have some thickness. For example, silicon is used as an example of a conductive layer, which has a thickness of 500 - 3000 Å . . . ." The Examiner then readily acknowledges that Akram does *not* disclose the thickness of the layers as claimed by the applicants.

Not only are teachings of Akram deficient in the ways noted by the Examiner, Akram further fails to teach or suggest a device having the layers as claimed, or a device having "a second layer arranged to function as one or more press contacts or wire bond pads," as is required in claims 1, 5, and 7-8.

Akram discloses an interconnect 10 for testing unpackaged semiconductor dice having raised contact locations, e.g., bumped bond pads. The interconnect 10 includes a substrate 12. (col. 5, lines 3-7). The interconnect 10 of Akram does not include bond pads as is alleged in the Office Action. Instead, Akram discloses an interconnect 10 for testing unpackaged semiconductor dice having raised contact locations, e.g., bumped bond pads. The substrate 12 of interconnect 10 has contact members 43 that are formed in a pattern that matches the size and spacing of the contact locations on the die. The contact members 43 include sharpened projections 40, 42, 44, 46 formed in an array of parallel spaced, elongated, knife edges (col. 6, lines 46-54). In Akram, an insulating layer 64 is formed over the substrate 12. A conductive layer 66 is formed on insulating layer 64. Conductive layer 66 may be formed of a highly

conductive metal such as aluminum or titanium. Alternatively, the conductive layer may be formed of a stack of two materials (Fig. 8a), including a barrier layer 68 and a bonding layer 70. Barrier layer 68 is formed of a metal that will not form a bond with a raised metal contact location on the die, e.g. platinum, titanium or a titanium alloy. Bonding layer 70 provides a bond with conductive traces 72a, and may be formed of a material such as aluminum, tungsten, or titanium.

Claim 1 specifies that the second layer overlies the first layer and is arranged to function as one or more press contacts or wire bond pads. In Akram, the bonding layer 70 may be formed of aluminum, tungsten or titanium. The barrier layer 68, which overlies the bonding layer, may be formed of platinum, titanium or a titanium alloy. This is the reverse of the arrangement of the present invention as defined in claim 1, which specifies that the first layer, which functions as electrodes or conductors, is a relatively hard or tough material such as titanium and the second layer, which functions as press contacts or wire bond pads, is formed of a relatively soft or malleable material such as aluminum.

For the above reasons, claim 1 is believed to patentably define over the disclosure of Akram.

Dependent claims 5 and 7-8 are believed to be in condition for allowance for incorporating by reference the limitations of claim 1 and for defining additional

features of the invention, which, when considered in combination with those of claim 1, are neither disclosed, taught, or suggested by the prior art relied upon in the rejection.

Claim 5 requires that “the first layer or set of layers is approximately 7000 Å thick.” The only thicknesses mentioned in Akram are those of a mask layer 16 and of a silicon containing layer 76. Column 5, lines 14-15 states that “A typical thickness for the mask layer 16 is about 500 Å to 3000 Å.” Column 7, lines 63-65 states that “A typical thickness of the silicon containing layer 76 would be from about 500 Å to 3000 Å.” Neither of these layers corresponds to the *first* layer of claim 6. The claimed thickness of the first layer provides the layer the ability to be etched without affecting the other layer or layers. Furthermore, the claimed thickness of the first layer limits or prevents plastic deformation and permanent shape change under the extreme conditions that are used during anodic bonding, which can be used to assemble the devices.

Claim 7 requires that “the second layer or set of layers is approximately 5000 Å thick.” Claim 8 requires that “the second layer or set of layers is approximately 2000 Å to 6000 Å thick.” Neither of the disclosed thicknesses in Akram corresponds to the thickness of the *second* layer. The claimed thicknesses permits etching of the second layer without affecting the other layer or layers. Additionally, the claimed thicknesses allow the second layer to deform during anodic bonding, which can be used to assemble the devices.

Thus, the references alone or in combination fail to teach or suggest the device of claims 1, 5, and 7-8. In light of the foregoing, withdrawal of the rejection of these claims is respectfully requested.

4. New Claims

New claims 22-33 have been added. Claims 22-24 depend from claim 1. Claim 22 further requires "a substrate, wherein the first layer overlies and is bonded directly to the substrate. Claim 24 further requires "wherein a sealed cavity is located in the device."

Claims 25-33 generally track original claims 1-9 except that claim 25 adds "wherein a sealed cavity is located in the device." The new claims are believed to be in condition for allowance for the reasons that claims 1-9 are believed to be in condition for allowance. In addition, claim 25 is believed to be in condition for allowance for incorporating the above-quoted language as none of the references, alone or in combination, disclose, teach, or suggest this combination of features. Claims 26-33 depend from new claim 25 and are also believed to be in condition for allowance.

CONCLUSION

It is submitted that original claims 1-9 are in compliance with 35 U.S.C. §§ 102 and 103 and each define patentable subject matter. New claims 22-33 are also believed to be allowable. A Notice of Allowance is therefore respectfully requested.



Should the Examiner consider any other fees to be payable in conjunction with this or any future communication, the Director is authorized to direct payment of such fees, or credit any overpayment to Deposit Account No. 50-1170.

The Examiner is invited to contact the undersigned by telephone if any questions remain after consideration of this response, or if such would otherwise facilitate prosecution.

Respectfully submitted,

By   
Andrew S. McConnell (Reg. No. 32,272)

Boyle, Fredrickson, Newholm,  
Stein & Gratz, S.C.  
250 East Wisconsin Avenue, Suite 1030  
Milwaukee, WI 53202  
(414) 225-9755  
Attorney Docket No.: 352.007

MARKED-UP VERSION OF AMENDED CLAIMS

1. **(Amended)** A device having electrical and mechanical components, the device comprising multiple layers **that include** ~~in which~~:

a first layer or set of layers arranged to function as one or more electrodes or conductors; and

a second layer **overlying the first layer and** arranged to function as one or more press contacts or wire bond pads, wherein the second layer has different physical properties than the first layer, wherein the first layer or set of layers is relatively hard or tough and the second layer is relatively soft or malleable.

4. **(Twice Amended)** A device according to claim 1, wherein the second ~~softer-soft~~ or ~~more~~-malleable layer is formed from one of aluminium or gold.

9. **(Twice Amended)** A device according to claim 1, wherein additional titanium is formed on one or more of the surfaces that form ~~the-an~~ inner surface of a sealed cavity in the ~~completed~~-device.